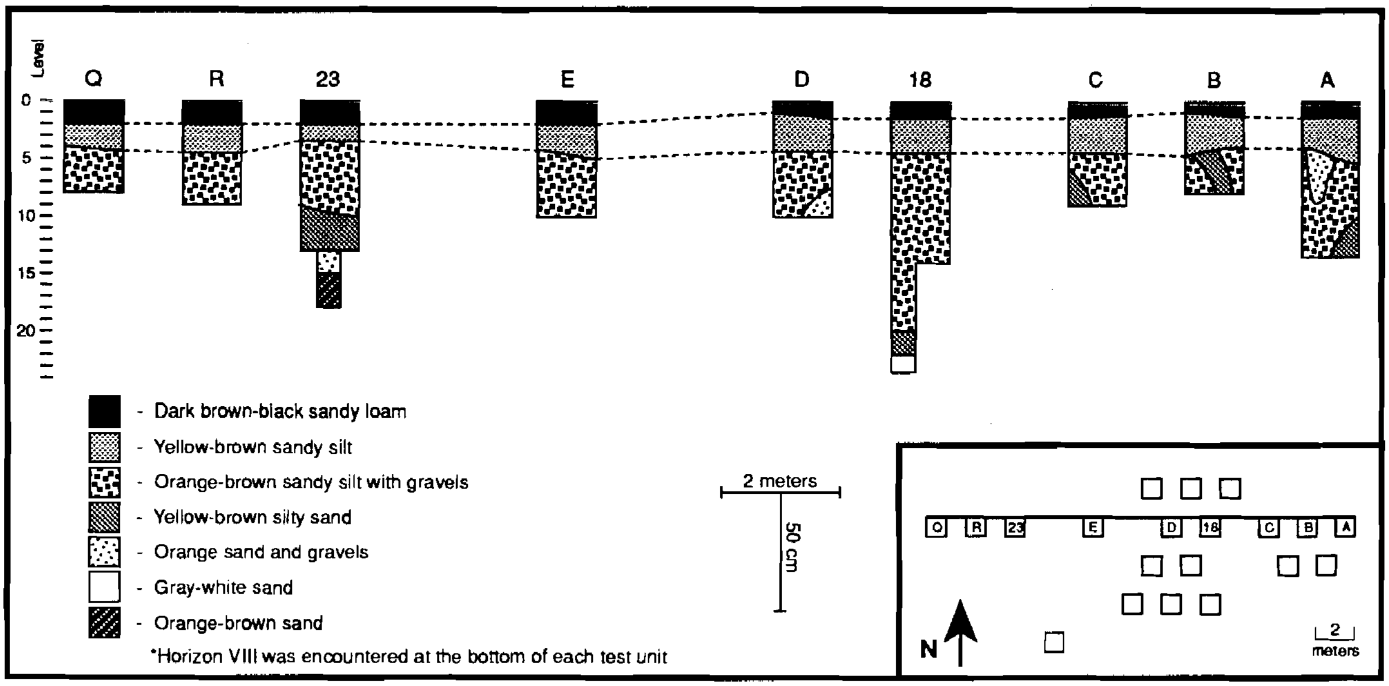
FIGURE 26

North Wall Profile--Area B



EXCAVATION RESULTS AND INTERPRETATIONS - AREA B

Area B is located approximately 30 m west of Area A and was excavated in a series of 1 m sq. test units based on the same grid as that used in Area A (Figures 7 and 11; Plate 1). Table 12 shows a summary catalog of the lithic artifacts.

Stratigraphy and Site Context

Figure 26 and Plate 10 show the natural stratigraphic profile of the north wall of Area B. The soil stratigraphy observed in Area B is consistent with that observed in Area A and with the geomorphological investigation of core samples extracted from the site (Appendix I).

The top of the profile consists of a dark brown recent humus soil (Horizon I) that extends to a depth of approximately 5-10 cm. Horizon II is a yellow-brown sandy silt that extends to a depth of approximately 20-25 cm and is continuous across the profile. Horizon III is an orange-brown sandy silt that varies between 40 cm and 100 cm in depth. Gravels are present in this horizon in some areas of the profile and probably represent Pleistocene-age deposits. Horizons IV - VII are sands that are coarser in texture than the overlying soils and also contain gravels. These sediments range in color from gray/ white through iron-rich orange and are not continuous across the site. They are more common in the eastern units and vary in depth from 25-120 cm below modern ground surface. Horizon VIII consists of an orange and gray thick clay soil unlike any of the overlying soils. This horizon was encountered at various depths but was present in most units at depths of 50 cm below modern ground surface (Figure 26) and its bottom limits are unknown.

TABLE 13

Summary Distribution of Total Artifact Counts by Level - Area B

	Level 1	2	3	4	5	6	7	8	9	10	11
Count	405	550	574	286	78	43	17	5	3	2	2
Percent	21	28	29	15	4	2	1	<1	<1	<1	<1
Cumulative percent	21	49	78	93	97	99	100	100	100	100	100

In sum, the basic stratigraphic profile of Area B consists of five parts: 1) a modern humus soil (Horizon I), 2) a yellow-brown sandy silt (Horizon II), 3) orange-brown sandy silt with gravels (Horizon III), 4) a series of various-colored coarse sands and gravels (Horizons IV-VII), and 5) an orange and gray thick clay soil (Horizon VIII).

The results of the geomorphological investigation (Appendix I) of the site previously discussed in the Area A stratigraphy section indicate that the major portion of the stratigraphic sequence consists of Pleistocene deposits of the Columbia Formation (Jordan 1964). The profiles exposed in Area B (Horizons III/IV - VIII) also confirm this observation. The age of Horizons II/III are more problematic and can best be determined by looking at the vertical distribution of artifacts through the profile.

Table 13 shows a summary distribution of artifact counts by level for Area B, and Figure 27 shows the cumulative percentage distribution with depth. These data show that the vast majority of the artifacts (almost 80%) are found within 20 cm of the modern ground surface. Table 13 shows that the artifacts increase in frequency with depth in the first three levels (0-20 cm). This translocation of artifacts down through the profile is likely due to the great amount of root disturbance observed throughout the excavation of Area B. The artifact frequency drops off considerably after Level 3, and it is likely that most of the artifacts found at depths of more than 20 cm were also translocated downward in the profile by root action, rodent burrowing, or other natural post-depositional processes. Therefore, Horizons II and III, with their occasional presence of pebbles, probably represent a silty low energy facies of the Columbia Formation.

FIGURE 27

Cumulative Percent of Total Artifacts with Depth-- Area B

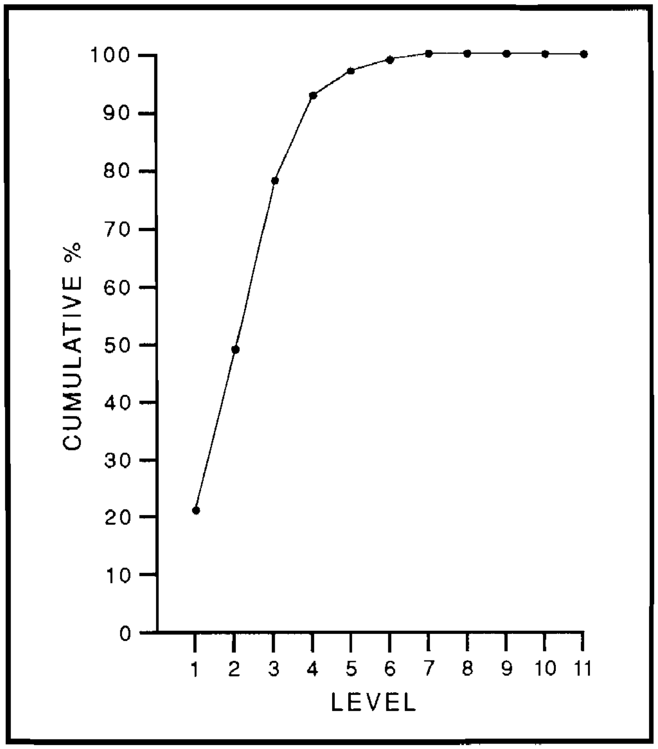
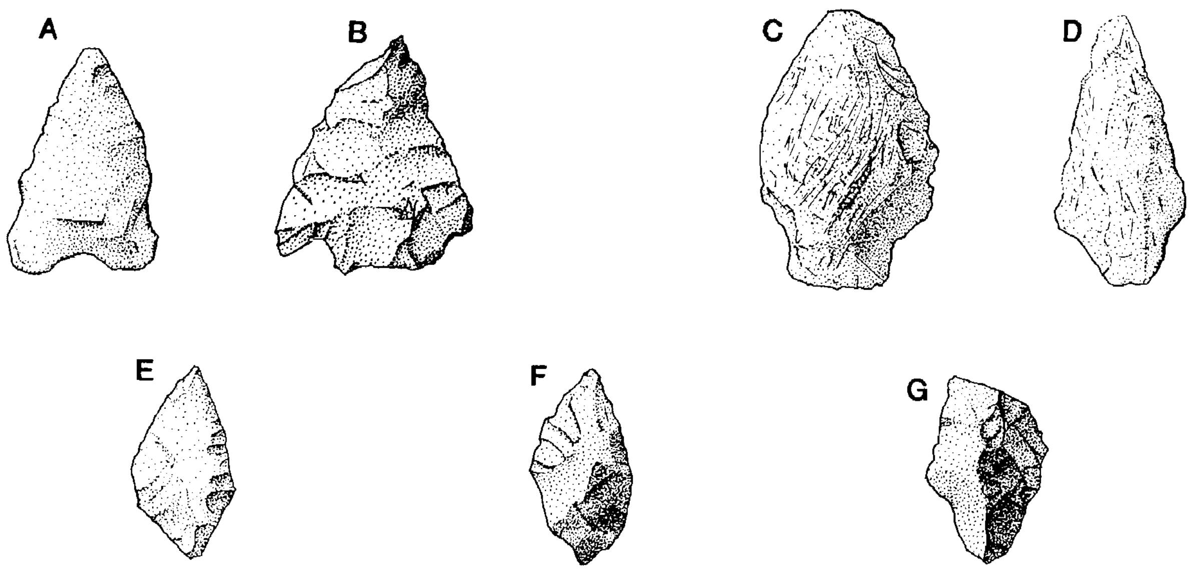


FIGURE 28

Projectile Points--Area B



A - Rhyolite bifurcate, N0 W37, Level 2
B - Jasper corner-notched, N2 W39, Level 3
C - Quartz stemmed, S4 W44, Level 3
D - Quartz stemmed, N0 W37, Level 4
E - Jasper stemmed, S6 W48, Level 3
F - Chert stemmed, S4 W42, Level 3
G - Chert stemmed, S4 W42, Level 2

1 cm

As was discussed for the stratigraphy of Area A, the shallow depth of the artifacts in Area B, their deposition in a thinly buried stratigraphic context, and the natural displacement of artifacts over considerable depth makes it impossible to distinguish separate components at the site. Therefore, as in Area A, all of the artifacts in Area B must be viewed as a series of disturbed multicomponent occupations for analysis.

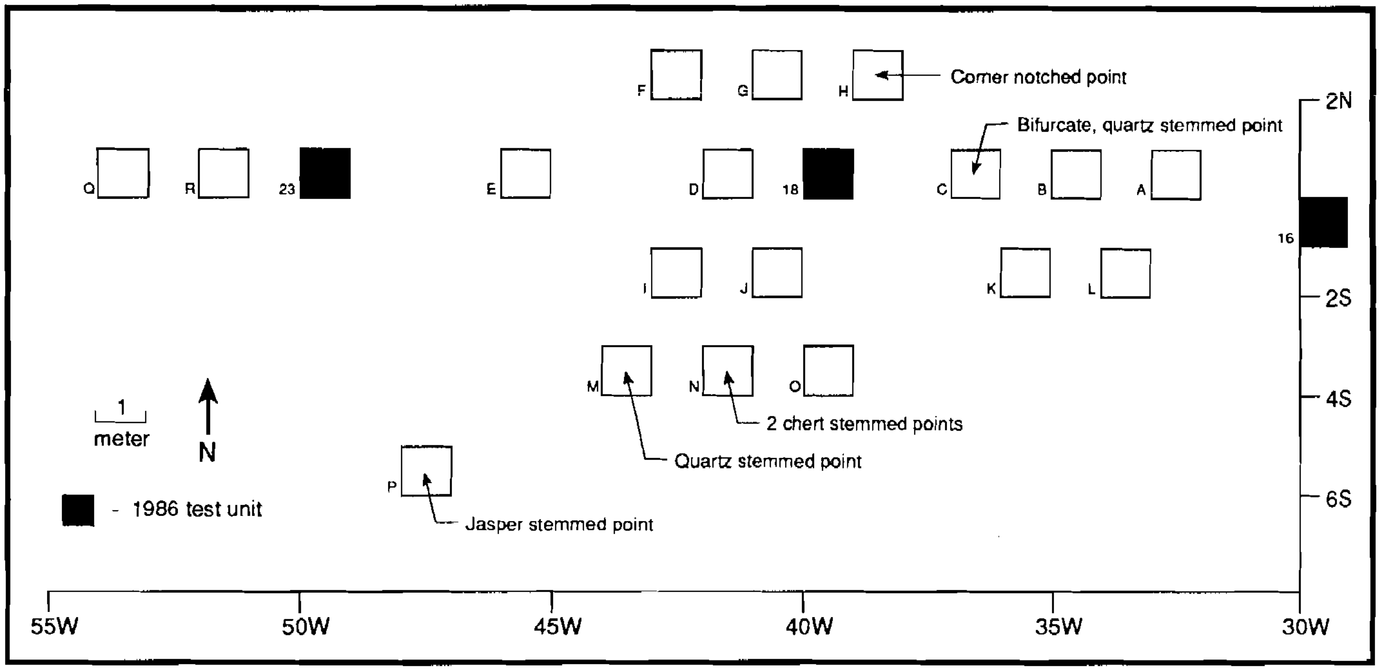
Site Chronology

No radiocarbon samples were recovered from Area B, and no ceramic wares were found in this area of the site. Therefore, diagnostic projectile points will serve as the main sources of data for determining the chronology of Area B's occupation. Figure 28 shows the diagnostic projectile points from Area B, and three basic types are present: bifurcate, notched, and stemmed forms. One rhyolite bifurcate base point (Figure 28A) was present in the assemblage. Radiocarbon dates have been recorded for bifurcate base points at the St. Alban's Site which date to 6210 B.C. +/- 100 years and 6880 B.C. +/ - 700 years (Broyles 1966:23-28), and occur no later than 6000-5500 B.C. (Broyles 1971:49; Michels and Dutt 1968). Their appearance in conjunction with the emergence of Holocene environments circa 6500 B.C. marks the beginning of the Archaic Period on the Delmarva Peninsula (Custer 1984:43-61).

A corner-notched point (Figure 28B) and several stemmed points (Figure 28C-G) were also located in Area B. As mentioned in the discussion on Area A, these particular morphological characteristics are not diagnostic of a specific cultural complex but are ascribed in general to the Woodland I Period

FIGURE 29

Distribution of Diagnostic Artifacts--Area B



(ca. 3000 B.C. - A.D. 1000). Figure 29 shows the location of the various points in Area B. The vertical location of two of the points provides further evidence of translocation or mixing of levels. Test Unit N0W37 contained the Archaic Period bifurcate base point (Figure 28A) in excavation level 2 (5-10 cm below surface), whereas the later Woodland I stemmed point (Figure 28D) was found in excavation level 4 (15-20 cm below surface) of the same test unit. Therefore, it is not possible to isolate particular occupations in Area B either vertically or horizontally. In sum, the assemblage of projectile points indicates that Area B was occupied during both the Archaic (ca. 6500-3000 B.C.) and Woodland I (ca. 3000 B.C. - A.D. 1000) but that the main occupation of Area B can be said to date to the Woodland I Period (ca. 3000 B.C. - A.D. 1000).

Chipped Stone Tool Technology

The lithic technologies represented at Area B will be analyzed by considering each of the major categories of lithic artifact types at the site.

Projectile Points. Figure 28 shows the projectile points, not including fragments, from Area B. Only one point (Figure 28C) appears to have been rejected due to damage that occurred in the course of manufacture. This quartz point is quite thick and suffered a break that removed its distal tip. Numerous deep step fractures are present along both lateral edges and in the area where the distal break occurred. The damage occurred in the later stages of thinning but the quartz material was apparently too brittle for further attempts at finishing the point.

The remaining points are discards. Two of the points (Figure 28A and 28D) show tip damage indicative of use as projectile points (Ahler 1971; Ahler and McMillan 1976:166). The jasper corner-notched point (Figure 28-B) is heavily resharpened and also suffered a fracture across its distal section.

Unlike the quartz reject, this point is thin, asymmetrically resharpened, and exhibits shallow step fractures and considerable micro-chipping along one edge indicating that it had likely been used in cutting or sawing activities before being discarded (Ahler and McMillan 1976:170; Tringham et al. 1974).

One of the remaining discarded points (Figure 28G) is a narrow contracting stem form with a transverse medial fracture. This type of fracture has been associated with twisting and prying motions (Ahler 1971; Custer and Bachman 1986). The two remaining discarded points (Figure 28E and 28F) are very small, thin, contracting-stem points made on flakes. Flake scars are primarily confined to the very edges of the lateral sides, particularly on the ventral surfaces. The jasper point (Figure 28E) shows numerous longitudinal step fractures along its lateral edges indicating that it was also used for cutting activities. However, the edges themselves are quite rounded indicating use on soft materials such as meat or soft wood (Tringham et al. 1974). The chert point (Figure 28F) exhibited similar characteristics except that the edges showed more crushing than rounding, indicating use on harder surfaces such as hard wood or bone (Tringham et al. 1974).

The majority of points in Area B are made of cryptocrystalline materials which are locally available in both primary and cobble form. Quartz is also represented in the point assemblage. No primary source of quartz is located near Paradise Lane but quartz is available in cobble form north of the site in the Fall Line zone. However, no cobble cortex is present on the quartz points. Rhyolite is also represented in the assemblage. Rhyolite is not locally available in northern Delaware, but late stage and finished rhyolite bifaces are present in the assemblages of the Churchman's Marsh sites located approximately 5-6 km northeast of the Paradise Lane Site and may indicate participation of the area's inhabitants in trade and exchange networks (Custer 1982, 1984).

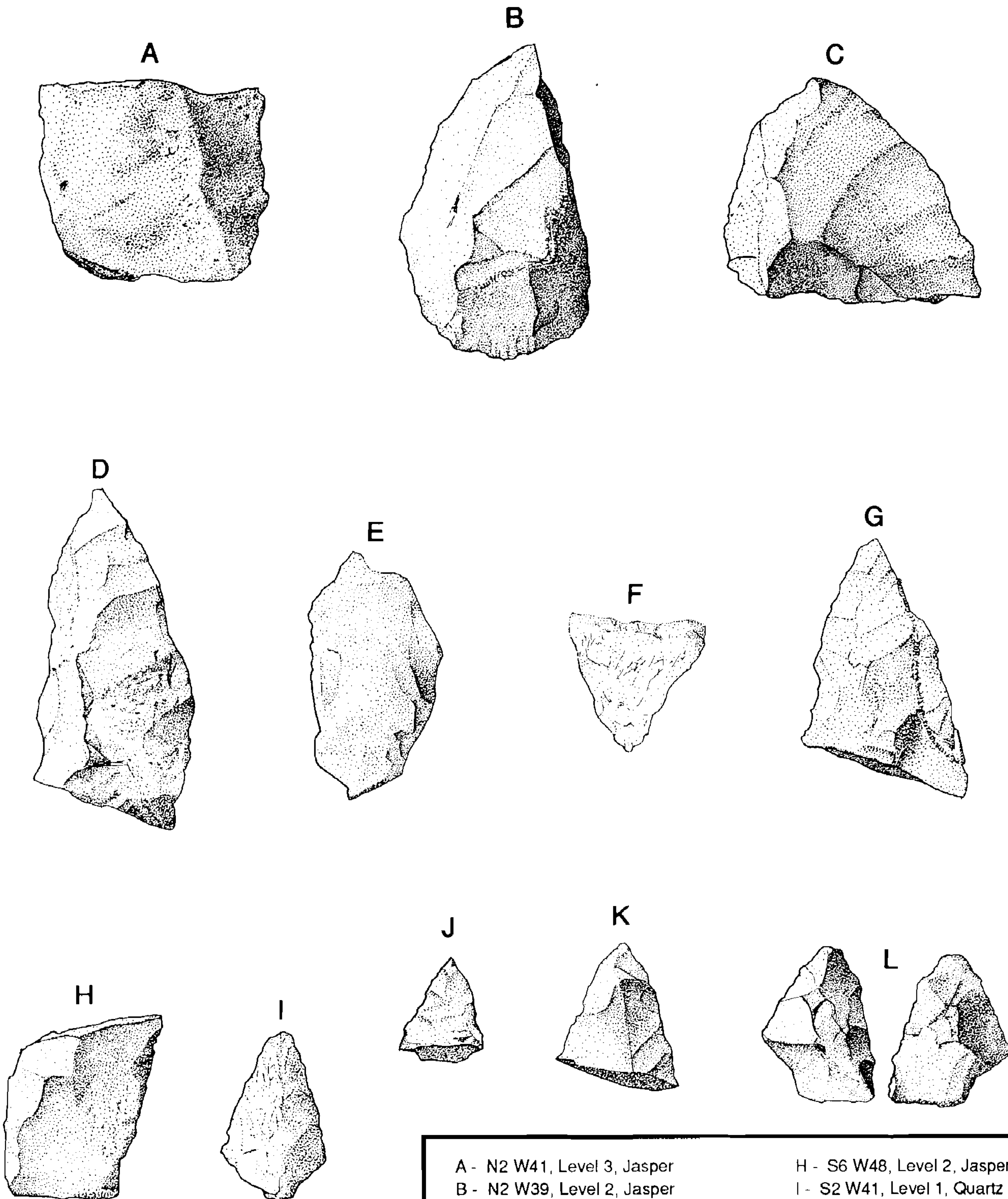
In sum, the projectile points from Area B consist largely of small discarded points in a variety of materials. The cryptocrystalline varieties are locally available; quartz is locally available only in cobble form; and rhyolite is not available in any raw form in northern Delaware. The discarded points appear to have been used in a variety of functions including cutting activities and as projectiles. The presence of one rejected point in the assemblage indicates that a minor amount of manufacture to replace points took place in Area B.

<u>Bifaces</u>. Figure 30 shows a sample of bifaces from Area B, and Table 14 shows a summary cross-tabulation of the biface and point manufacturing stages and raw materials. The assemblage includes bifaces in a variety of manufacturing stages and conditions of damage. Late stage bifaces and finished points (62%) outnumber early stage bifaces (38%; Table 14). The number of rejected bifaces and discarded bifaces is the same (Table 14). Bifaces made from non-local materials (i.e., quartzite and rhyolite) are discards, indicating that they were carried into the site and ultimately culled from the tool kit. The overwhelming majority of all bifaces are made of cryptocrystalline jasper and chert (65%), followed by quartz and quartzite (31%). Only one biface (Figure 30E) shows any signs of remnant cortex, thus indicating that primary sources of raw material, mainly jasper, were preferred.

Several of the early stage bifaces are quite thick and exhibit fractures across their mid-sections (Figure 30A and C). Manufacturing errors of this type occur most often in the course of end-thinning even though the snap occurs across the mid-section (Callahan 1979:109). Some of the manufacturing errors resulted in lateral breaks (Figure 30B). A couple of the early stage bifaces were made from flakes (Figure 30E and F).

FIGURE 30

Sample of Bifaces--Area B



A - N2 W41, Level 3, Jasper
B - N2 W39, Level 2, Jasper
C - S4 W42, Level 2, Chert
D - S2 W34, Level 1, Jasper
E - S2 W34, Level 4, Quartz
F - S4 W40, Level 2, Quartz
G - N0 W35, Level 2, Jasper
H - S6 W48, Level 2, Jasper
I - S2 W41, Level 1, Quartz
J - N0 W33, Level 5, Jasper
K - S2 W34, Level 3, Jasper
L - S2 W41, Level 1, Chert

1 cm

TABLE 14

Cross-tabulation of Biface/Point Types and Raw Materials - Area B

Tool class	Quartzite	Quartz	Chert	Jasper	Rhyolite	Total
Rejects	0	4(1)	1	8	0	13(1)
Discards	2	2	2	6	1	13
Total	**2**	**6(1)**	**3**	**14**	**1**	**26(1)**
Early stage bifaces	0	3(1)	1	6	0	10(1)
Late stage bifaces	2	1	0	6	0	9
Points	0	2	2	2	1	7
Total	**2**	**6(1)**	**3**	**14**	**1**	**26(1)**

( ) = cortex

Only two bifaces in the later stages of manufacture show rejection due to manufacturing errors (Figure 30G and H). One jasper biface distal fragment (Figure 30G) contained crystal inclusions which made it vulnerable to fracture, and the other biface (Figure 30H), a jasper proximal fragment, suffered a transverse medial fracture as a result of attempts to remove a medial ridge.

In addition to manufacturing errors, many of the late stage bifaces show signs of damage from use. One quartz biface (Figure 30I) snapped off just above its hafting element. Several other bifaces had transverse medial fractures. The fragments (Figure 30J, K, L) are not associated with step or hinge fractures, humps, or other attributes that would indicate manufacturing flaws. Ahler (1971) has observed that these types of fractures occur as a result of twisting and prying motions. One of the bifaces (Figure 30L) was retouched across its fracture plane and possibly utilized before being discarded.

In sum, the biface assemblage from Area B consists of more late stage and finished bifaces than early stage bifaces, and an equal number of rejects and discards. As in Area A, jasper is the preferred raw material, followed by quartz. Bifaces made from non-local quartzite and rhyolite were culled from curated tool kits and discarded in Area B along with tools made from locally available cryptocrystalline materials. A degree of manufacturing to replace culled tools is also indicated. Only one tool had cortex, indicating that the manufacture of tools from local cobble resources was not an important activity in Area B.

Cores. All cores recovered from Area B are jasper and are medium in size (5 cm maximum dimension) and chunky or blocky in form (Plate 11). In general, areas of flake removal indicate that wide flakes rather than elongate blade-like flakes were preferred. It would appear that sufficient material remained on the cores to produce further flakes, however, closer inspection shows that iron encrustations and other inclusions are present on the cores which may have led to their abandonment. None of the cores had any signs of cortex, thus indicating that secondary cobbles were not important sources of raw material for tool manufacture in Area B.

PLATE 11

Sample of Cores--Area B

Note: All four cores are jasper

Flake Tools. No flake tools were found during the excavation of Area B. Only four jasper unretouched, utilized flakes were found in this area of the site.

Debitage. Table 15 shows the distribution of various types of raw materials and the presence of cortex on the debitage from Area B. The assemblage is composed overwhelmingly of jasper debitage and only one percent of this debitage has cortex. The raw material preference is understandable in light of the site's relatively close proximity to Delaware Chalcedony Complex quarries at Iron Hill (Custer, Ward, and Watson 1986). The highest incidence of cortex (25%) occurs on quartzite flakes. However, only one percent of the total debitage assemblage is quartzite flakes, thus the quartzite sample is too small for reliable interpretation.

TABLE 15

Debitage Cortex and Raw Material - Area B

Cortex Presence/ Absence	Jasper	Quartz	Quartzite	Chert	Argillite	Chalcedony	Ironstone
Absent (% of raw material)	1,673 (99)	96 (86)	21 (75)	18 (86)	1 (100)	44 (100)	4 (100)
Present (% of raw material)	15 (1)	15 (14)	7 (25)	3 (14)	0 (0)	0 (0)	0 (0)
Total (% of total raw material)	1,688 (89)	111 (6)	28 (1)	21 (1)	1 (<1)	44 (2)	4 (<1)

TABLE 16

Debitage Attribute Frequencies - Area B

Flake type		**Size**		**Platform shape**		**Platform preparation**	
Complete	38	< 2 cm	64	Triangular	20	Present	12
Proximal	34	2-5 cm	36	Flat	4	Absent	60
Medial	7	> 5 cm	0	Round	48	No observation	28
Distal	21			No observation	28		
		Scar count				**Directions count**	
Cortex		Mean	= 1.78	**Remnant Biface Edge**		Mean	= 1.57
Present	10	Standard deviation	= 1.09	Present	3	Standard deviation	= 1.20
Absent	90			Absent	97		

Sample of 100 flakes

A flake attribute test (Appendix II) was conducted on a sample of 100 randomly selected flakes from Area B in order to determine whether the flakes resulted from the reduction of bifaces or cores (Table 16). Biface reduction was more important than core reduction in meeting the lithic needs of Area B's inhabitants.

For example, 62% of the sample consists of broken flakes which suggests biface reduction (Lowery and Custer 1990:97). The low incidence of cortex on sample flakes indicates that primary raw materials were preferred. The majority of flakes (64%) are quite small which indicates that they did not result from the reduction of large cores or large early stage bifaces. However, the mean values for the number of scars present on the dorsal surfaces of the flakes and the number of directions from which the scars are oriented are most closely associated with the early stages of biface reduction (Appendix II: Table 34). The prominence of small flakes in the sample may be due to the occupants' use of small biface preforms, and with other activities such as tool edge maintenance and later stage thinning. The high incidence of round and triangular platforms indicates biface reduction. The presence of platform preparation (12%) and biface edges (3%), though low, indicate biface reduction activities. In sum, the results show that biface reduction was practiced more commonly than core reduction in Area B, but that both early and late stage thinning were important.

FIGURE 31

Distribution of Tools--Area B

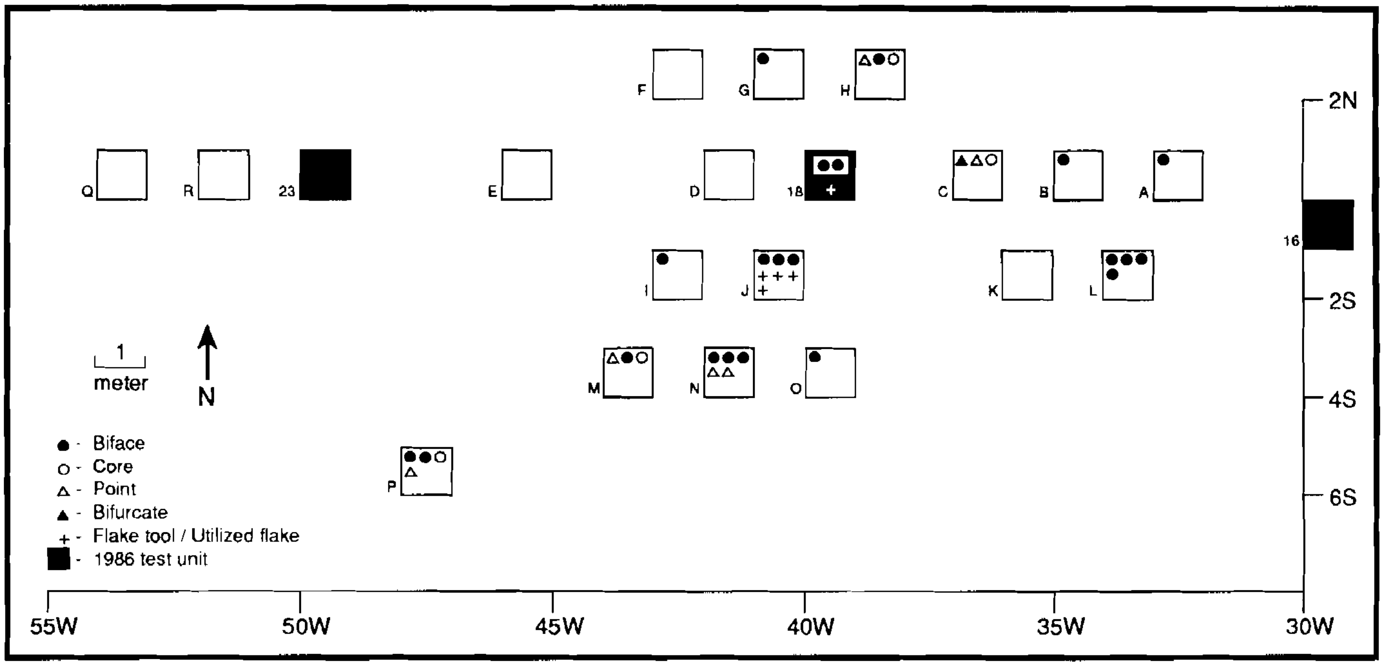


FIGURE 32

Distribution of Total Debitage--Area B

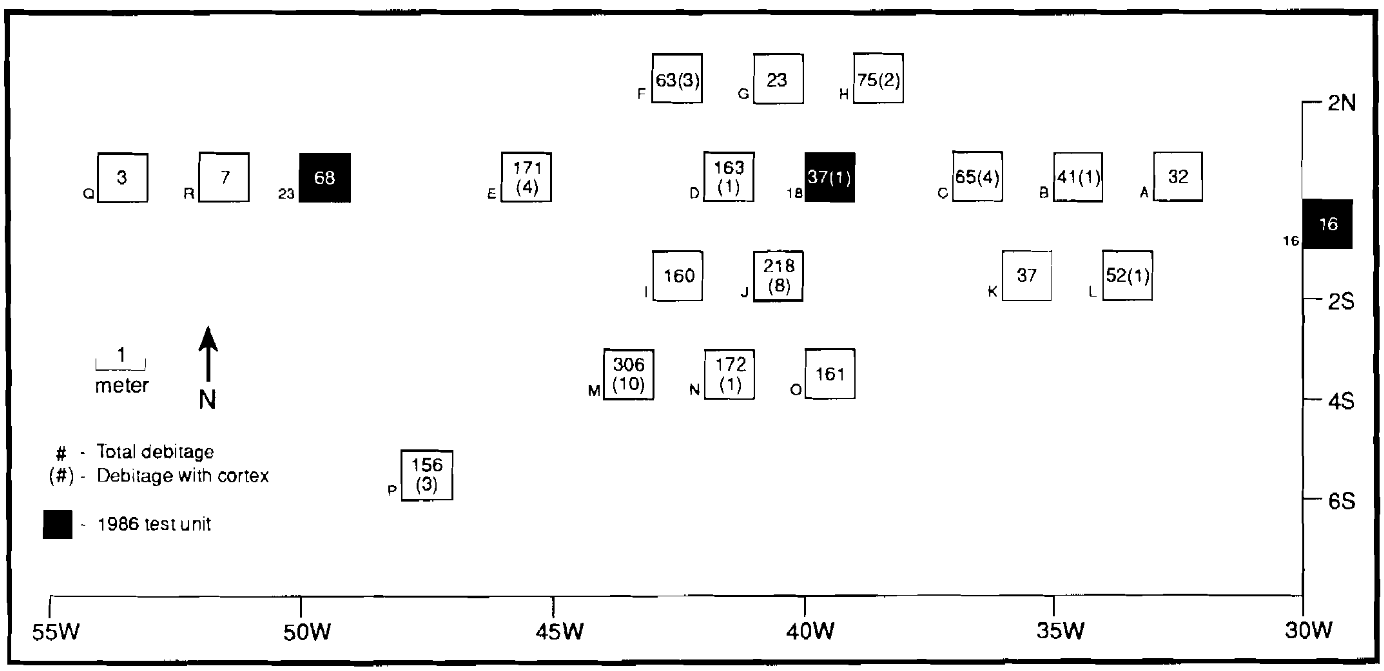
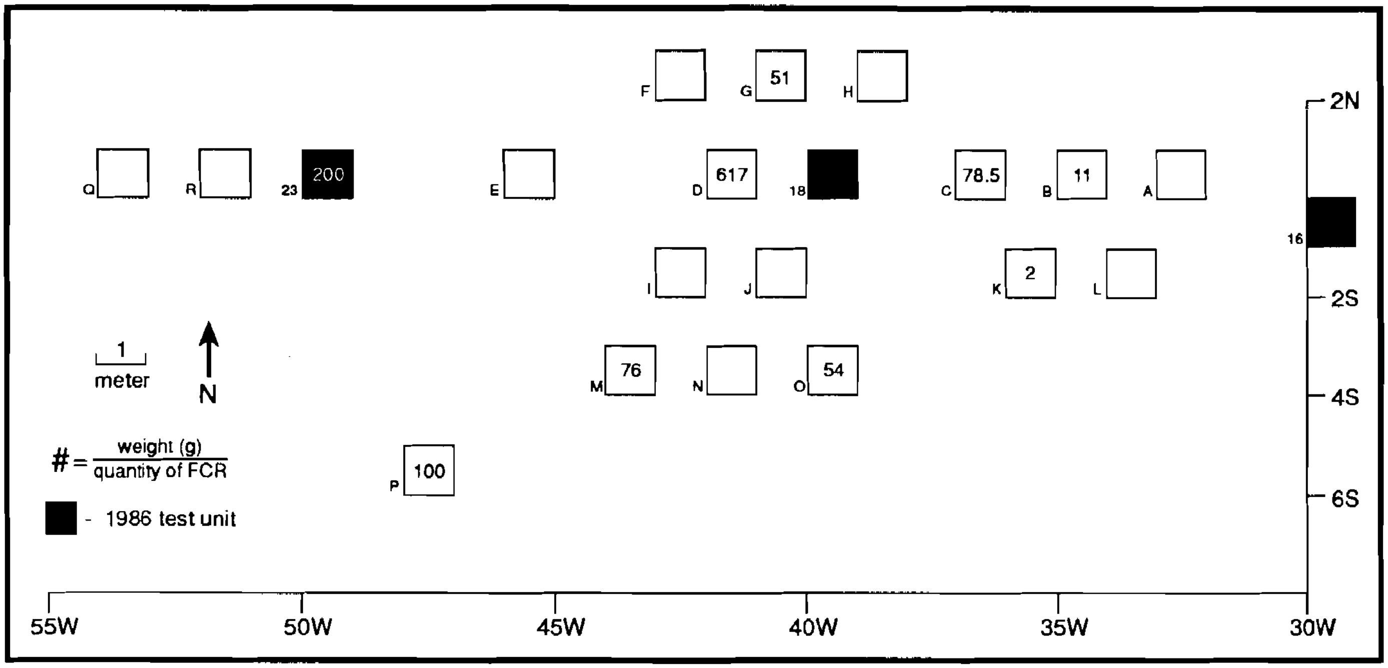


FIGURE 33

Distribution of Fire-Cracked Rocks--Area B



Activity Areas

In order to delineate any horizontal clustering, the spatial distributions of various artifact classes (tools, debitage, and fire-cracked rocks) were mapped using each 1 m sq. test unit as a minimum provenience unit within undisturbed soils. As mentioned in the section on site stratigraphy and chronology, the vertical position of artifacts is thought to be disturbed; therefore, artifacts from all levels have been combined together for the analysis of activity areas.

Figures 31-33 show the location of all tools, debitage, and fire-cracked rocks recovered from Area B, and Plate 12 shows a sample of the artifacts recovered. Tool concentrations are densest in the central section of Area B, with additional small concentrations southwest and east of the core area. The core area concentration consists mainly of bifaces and utilized flakes.

Figure 34 shows the location of early and late stage bifaces (Callahan 1979), and Figure 35 shows the location of bifaces that were rejected in the course of manufacture as well as those that were used and discarded due to damage or extreme wear. Neither of the distributions shows discrete areas of activity.

Figure 32 shows the distribution of debitage in Area B. Flakes are largely concentrated in the core section of Area B. Figures 36 and 37 show the distribution of jasper and quartz flakes, which generally conform to the distribution for total flakes. Flakes of various other raw materials (quartzite, chert, chalcedony, argillite, and ironstone) are present in such small quantities that mapping their distributions would not add meaningfully to the analyses, and these distributions were not mapped.

FIGURE 34

Distribution of Early Stage and Late Stage Bifaces--Area B

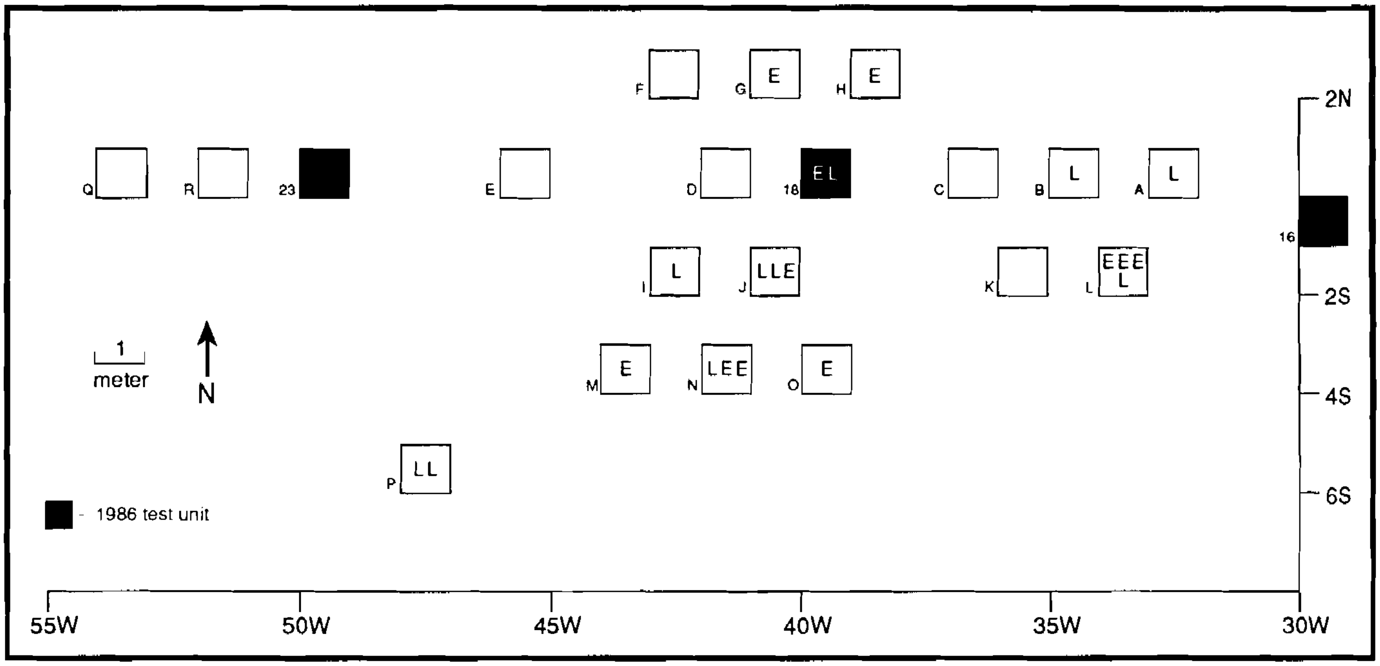


FIGURE 35

Distribution of Rejected and Discarded Bifaces--Area B

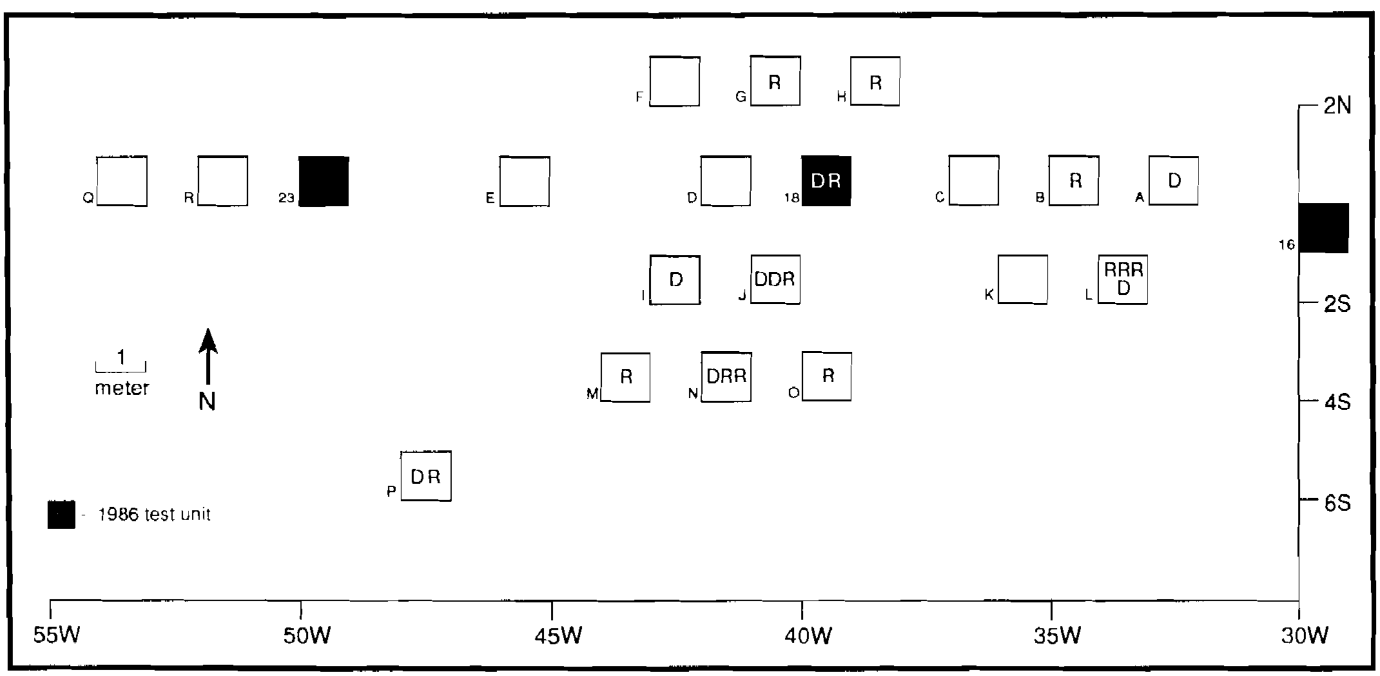


FIGURE 36

Distribution of Jasper Flakes--Area B

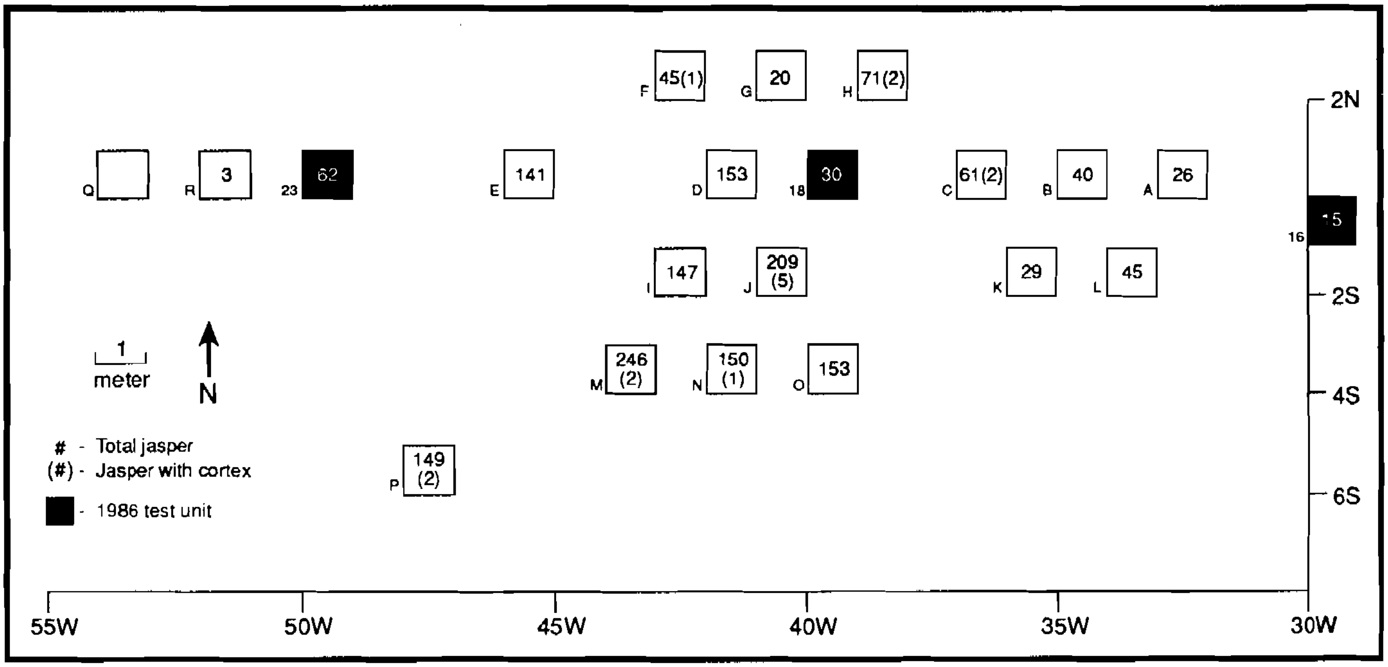


FIGURE 37

Distribution of Quartz Flakes--Area B

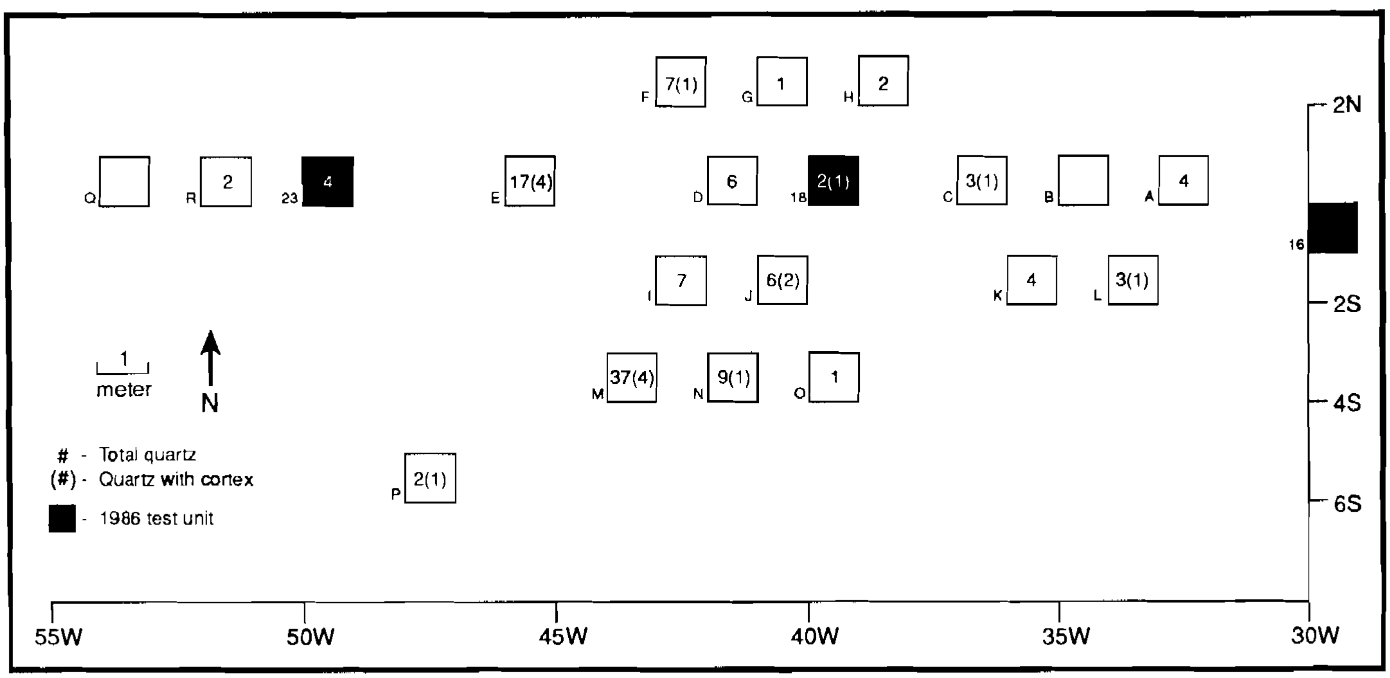
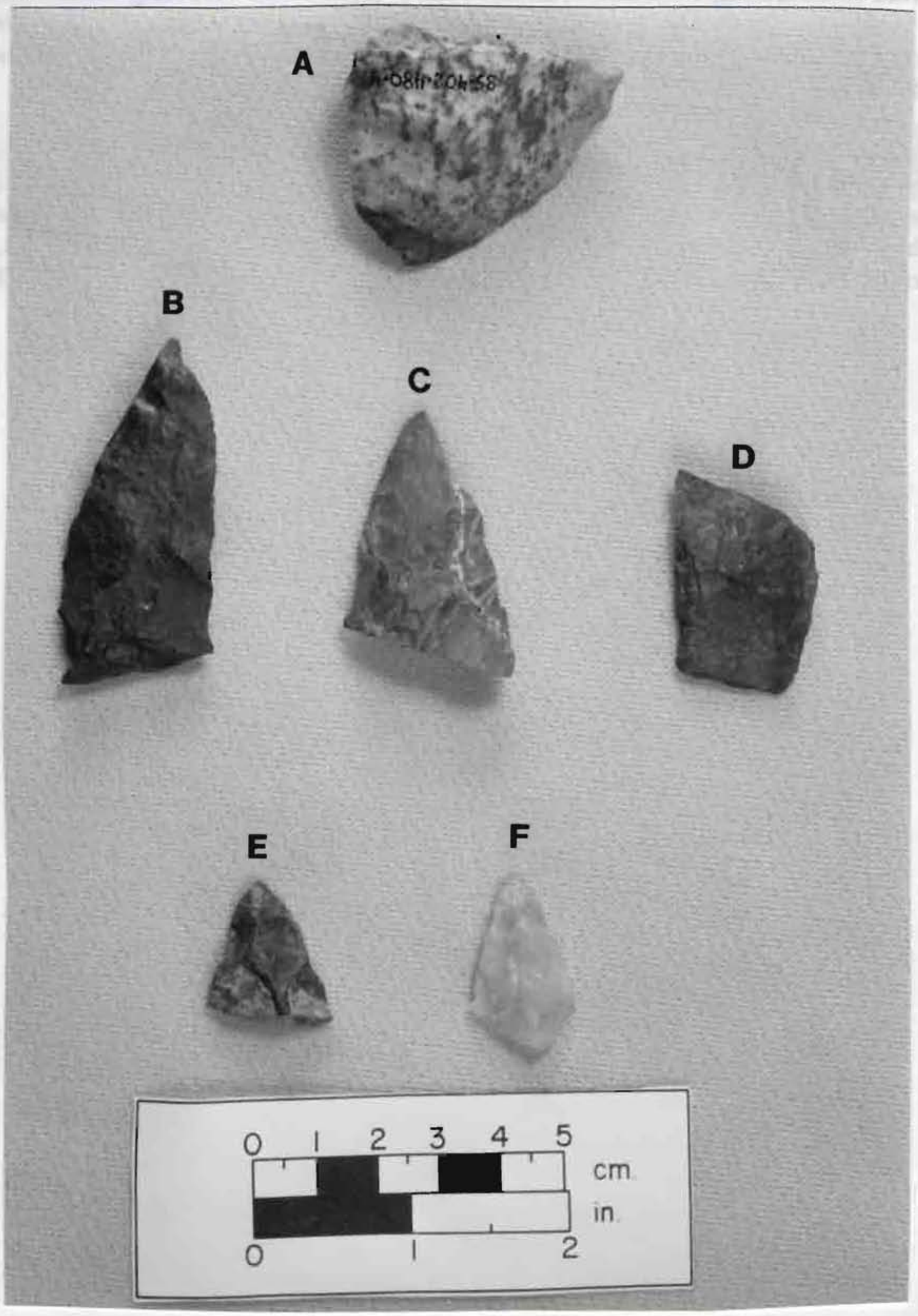


PLATE 12

Sample of Artifacts Recovered from Area B



A - Chert early stage biface reject	C - Jasper late stage biface reject	E - Jasper late stage biface (discard)
B - Jasper early stage biface reject	D - Jasper late stage biface fragment	F - Quartz late stage biface (discard)

Figure 33 shows the distribution of fire-cracked rocks in Area B. Small concentrations are dispersed throughout Area B, with the largest located in Test Unit D (N0W42) in the core area. The presence of debitage, as well as both discarded and rejected bifaces in the core area surrounding a fire-cracked rock concentration, indicates that damaged and exhausted tools were being culled from curated tool kits while some small-scale manufacturing of replacement tools was also taking place. Although no flotation samples were taken from Area B, the absence of ceramic wares and groundstone tools suggests that food processing and preparation were not important activities.

In sum, no discrete areas of activity can be inferred from the data in Area B. In general, the artifact types and their distributions indicate that Area B functioned in a similar capacity to Area A; i.e., an area where tool manufacturing took place on a small scale to replace discarded damaged and exhausted tools. The data suggests that Area B was occupied during the Archaic Period (ca. 6500-3000 B.C.), but that the main occupation took place during the Woodland I Period (ca. 3000 B.C. - A.D. 1000).